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Detroit Edison

10CFR50.73

April 27, 2000
NRC-00-0030

U S Nuclear Regulatory Commission
Attention: Document Control Desk
Washington D C 20555

Reference: Fermi 2
NRC Docket No. 50-341
NRC License No. NPF-43

Subject: Licensee Event Report (LER) No. 00-004

Pursuant to 10 CFR 50.73(a)(2)(iv), Detroit Edison is submitting the enclosed LER No. 00-004. The LER documents the initiation of an unplanned manual scram during shutdown for the seventh refueling outage.

No new commitments are being made in this LER.

Should you have any questions or require additional information, please contact Mr. Norman K. Peterson of my staff at (734) 586-4258.

Sincerely,

cc: J. Dyer
A. J. Kugler
M. A. Ring
M. V. Yudasz, Jr.
NRC Resident Office
Region III
Wayne County Emergency Management Division

IE22

NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION
(6-1998)

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

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TITLE (4) Unplanned Manual Reactor Scram Following Recirculation Pump Trip During Plant Shutdown

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
04	01	00	00	--0 0 4--	00	04	27	00	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)	24		20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
			20.2203(a)(1)		20.2203(a)(3)(I)		50.73(a)(2)(ii)		50.73(a)(2)(x)
			20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
			20.2203(a)(2)(ii)		20.2203(a)(4)	X	50.73(a)(2)(iv)		OTHER
			20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A
			20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Joseph M. Pendergast – Principal Compliance Engineer	(734) 586-1682

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE).	X NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On April 1, 2000 at 1200 hours, a planned shutdown began for the seventh refueling outage. At 1815 hours, operators lowered the Reactor Recirculation Pump (RRP) speed to 30 percent. At that time, the "A" RRP speed oscillated between approximately 24 and 30 percent speed. This type of RRP speed oscillation is due to the hydraulic characteristics of RRP Motor Generator [MG] set fluid coupling and is expected near the 24 to 28 percent RRP speed range. The "A" MG fluid coupler scoop tube was locked in an attempt to maintain "A" RRP speed constant. The scoop tube apparently did not lock and the "A" RRP speed increased rapidly. The "A" RRP was immediately tripped as required by plant procedures. In single loop operation, procedures require the remaining ("B") RRP speed be maintained at greater than 50 percent. This could not be achieved because at the low power condition that existed at the time, RRP speed is limited to 31.5 percent speed. Lacking specific procedural guidance for the conditions that existed, reactor operators decided to manually trip the reactor. At 1915 hours, with reactor power at approximately 24 percent the mode switch was placed in shutdown, initiating a manual scram. Troubleshooting of the scoop tube and its controls could not duplicate or determine the cause for the scoop tube not locking. Additional post maintenance testing is planned during restart from the refueling outage. Corrective actions include development of appropriate procedural guidance for single loop operation at low power conditions.

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TEXT *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

Initial Plant Conditions:

Mode	1 (Power Operation)
Reactor Power	24 Percent
Reactor Pressure	995 psig
Reactor Temperature	530 Degrees Fahrenheit

Description of the Event:

On April 1, 2000 at 1200 hours, a planned shutdown began for the seventh refueling outage. The control room operators [utility-licensed] began reducing reactor power from 88 percent per General Operating Procedure (GOP) 22.000.03, "Power Operation 25% to 100% to 25%."

At 1815, hours, while performing step 5.2.19 of GOP 22.000.03 that requires lowering both Reactor Recirculation Pumps [AD] (RRP) speed to 30 percent, the "A" RRP speed oscillated between approximately 24 and 30 percent speed. This type of RRP speed oscillation is due to the hydraulic characteristics of RRP Motor Generator [MG] set fluid coupling [CPLG] and is expected near the 24 to 28 percent RRP speed range. The "A" MG fluid coupler scoop tube was locked remotely from the control room in an attempt to maintain "A" RRP speed constant. The "A" RRP scoop tube apparently did not lock and the "A" RRP speed increased rapidly. The "A" RRP was immediately tripped in accordance with Abnormal Operating Procedure (AOP) 20.138.03.

The trip of the "A" RRP resulted in the plant operating at approximately 24 percent reactor power in single loop operation with the "B" RRP supplying forced circulation. AOP 20.138.01, "Recirculation Pump Trip," requires pump speed be maintained at greater than 50 percent in single loop operation. This could not be achieved at low power because the Number 1 Limiter [SCO] limits pump speed to approximately 31.5 percent when feedwater flow is less than 20 percent. Instrumentation indicated that total core flow was lower than the natural circulation flow curve on the power to flow map. The reactor operators conferred with reactor engineers and confirmed that core flow was adequate and that the low indicated total core flow was expected due to characteristics of the total core flow instrumentation while in single loop operation. However, lacking specific procedural guidance addressing single loop operation when RRP speed could not be increased to 50 percent, the operators decided to trip the unit. At 1915 hours, with reactor power at approximately 24 percent the operator placed the mode switch in Shutdown, initiating a manual scram.

Plant systems responded as designed. All control rods [JD] fully inserted. Post scram Feedwater Logic [FCO] actuated, as expected. Reactor Water Level decreased to 160 inches as expected, and Level 3 primary containment isolation valves [ISV] for Groups 4 (Shutdown Cooling/Head spray), 13 (Drywell sumps), and 15 (Traversing In-core Probe) isolated as designed. No Emergency Core Cooling Systems were challenged. The plant was stabilized, and at 1948 hours, the Level 3 isolations were reset. At 2012 hours, the scram was reset.

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TEXT *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

A four hour notification required by 10CFR50.72(b)(2)(ii) was made at 2228 hours, on April 1, 2000, (Event Number 36854) for any event or condition that resulted in a manual actuation of any Engineered Safety Feature, including the Reactor Protection System. This report is being submitted under 10CFR50.73(a)(2)(iv).

Cause of the Event:

The reactor was manually tripped because there was insufficient specific procedural guidance addressing the plant conditions which existed at the time. AOP 20.138.01 requires maintaining RRP pump speed at greater than 50 percent while in single loop operation. This could not be accomplished at the low power conditions which existed at this point in the reactor shutdown. Feedwater flow was less than 20 percent which invokes the RRP A and B Number 1 Flow Limiter. The Number 1 Flow Limiter prevents raising recirculation pump speed above approximately 31.5 percent.

In this event, single loop operation at low power resulted from the manual trip of the "A" RRP MG set due to the unexpected speed increase when operators attempted to lock the scoop tube to control the RRP speed oscillation that was encountered at approximately 30 percent pump speed. The speed oscillation is an expected phenomenon which occurs near the approximately 24-28 percent and 52-58 percent speed ranges and is due to hydrodynamic characteristics of the scoop tube and MG set fluid coupling. Initial troubleshooting determined that the scoop tube positioner servomotor had de-energized when the operator attempted to lock the scoop tube, but the scoop tube brake [BRK] holding coil did not de-energize resulting in the scoop tube brake not being applied. With the scoop tube unrestrained, the hydraulic force acting on the scoop tube moved it in the increased speed direction, resulting in the pump speed increase. Subsequent disassembly of the scoop tube positioner and troubleshooting of the control circuitry were unable to duplicate or determine the cause of the scoop tube brake holding coil not de-energizing.

Analysis of the Event:

This event had no impact on the health and safety of the public. The plant was at low power with one RRP in operation for approximately one hour prior to the decision to manually trip the reactor. During this period reactor operators conferred with the reactor engineers and confirmed that adequate core flow was maintained, even though total core flow instrumentation indicated that total core flow was lower than the natural circulation flow curve on the power-to-flow map. When both RRPs are operating the instrumentation sums the flow contributions from each loop to calculate total core flow. With one RRP tripped the instrumentation subtracts the core flow indicated for the non-operating loop from that of the operating loop, because at high flows in single loop operation there is reverse flow in the non-operating loop. At low flows in single loop operation, there is forward flow in both loops; however, the instrumentation subtracts the non-operating loop flow, which resulted in a total indicated core flow that was less than physically possible, for the conditions that existed during this event.

Reactor power was at or near the power level where a manual scram is normally inserted for a planned shutdown. Plant equipment and systems responded as expected.

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TEXT *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

All control rods fully inserted within their required scram time. As expected, reactor water level decreased from 196 to 160 inches above the Top of Active Fuel (TAF). Reactor water Level 3 isolation valves closed as designed at 173 inches above TAF. Post Scram Feedwater Logic actuated and the North Reactor Feed Pump (RFP) speed decreased to minimum as designed. The Emergency Core Cooling Systems were not challenged. Reactor water level was restored and maintained in its normal band with the North RFP through the Start-up Level Feedwater Control Valve. Post Scram recovery actions were appropriately conducted.

Corrective Actions:

This event was documented in the Fermi 2 Corrective Action Program.

The scoop tube positioner cabinet was disassembled and the internal mechanisms visually inspected. Circuitry for positioner motor and brake were checked. Associated relays for the servomotor and brake coil were bench tested. The relays were re-installed in the positioner cabinet and field tested. No problems with the mechanical or electrical systems were identified from the inspection. Additional post-maintenance testing is planned during restart from the seventh refueling outage to verify correct operation of the RRP MG set scoop tube controls.

Further corrective actions, including the development of appropriate procedural guidance addressing single loop operation at low power will be accomplished commensurate with the established priorities and processes of the Fermi 2 Corrective Action Program.

Additional Information:

A. Previous Similar Events

There were no previous manual scrams initiated due to similar problems encountered during low power single loop operation.

B. Failed Component Data

None.